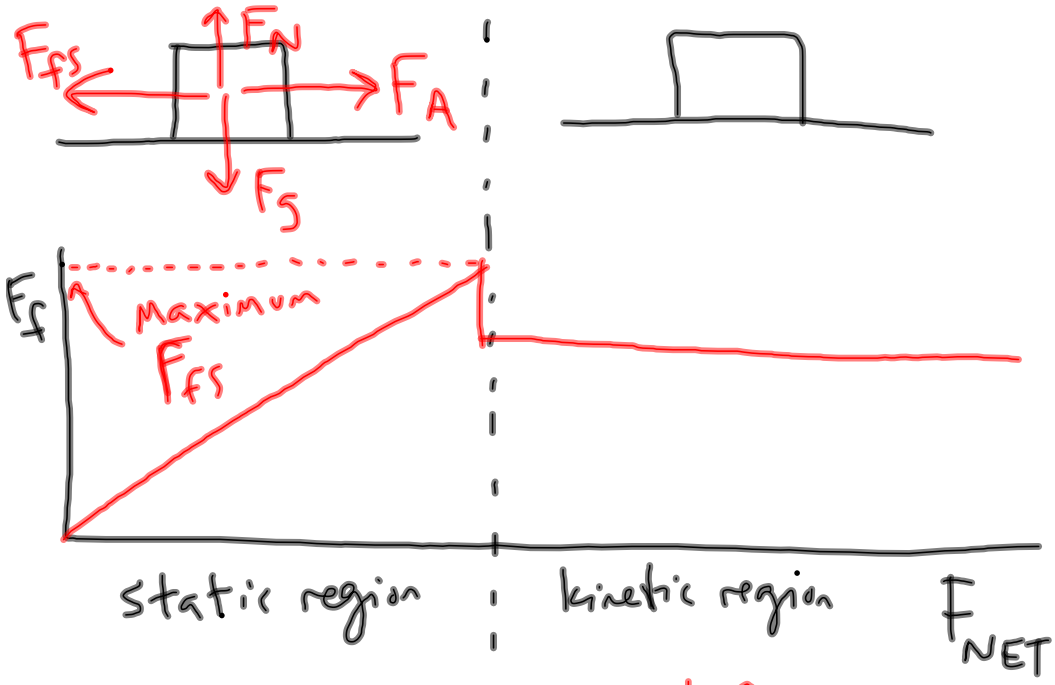
**Force of Friction Notes and Practice Problems 4th Block 9.19.11**




↳ normal force

$$F_{fs} = \mu_s F_N$$

↳ coefficient of static friction

↳ force of static friction

$$F_{fk} = \mu_k F_N$$

↳ normal force

↳ coefficient of kinetic friction

↳ force of kinetic friction

$\mu_s, \mu_k$ are unitless quantities

$$\mu_s > \mu_k$$

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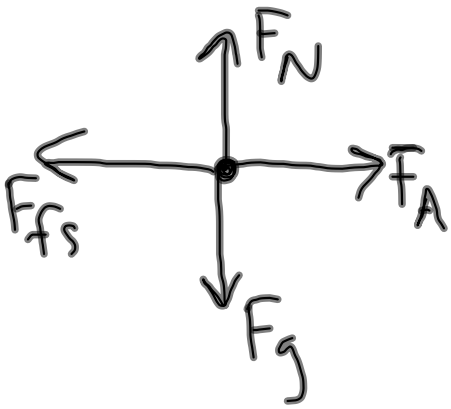
A 24 kg crate initially at rest on a horizontal floor requires a 75 N horizontal force to set it in motion. Find the coefficient of static friction between the crate and the floor.


$$F_{fs} = \mu_s F_N$$

$$\mu_s = \frac{F_{fs}}{F_N}$$

$$= \frac{75\ N}{235.2\ N}$$

$$= .319$$

$$\Sigma F_x = 0$$

$$F_A - F_{fs} = 0$$

$$F_{fs} = F_A = 75\ N$$

$$\Sigma F_y = 0$$

$$F_N - F_g = 0$$

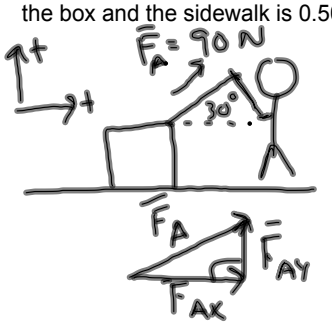
$$F_N = F_g = mg$$

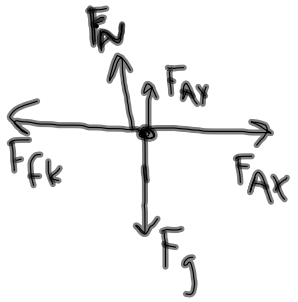
$$= (24\ kg)(9.8\ m/s^2)$$

$$= 235.2\ N$$

## Force of Friction Notes and Practice Problems 4th Block 9.19.11

- A student attaches a rope to a 20.0 kg box of books. He pulls with a force of 90.0 N at an angle of 30.0 degrees with the horizontal. The coefficient of kinetic friction between the box and the sidewalk is 0.500. Find the acceleration of the box. in the x-direction.




$$\sum \vec{F}_x = m a_x$$

$$a_x = \frac{\sum F_x}{m}$$

$$= \frac{2.4\ N}{20\ kg}$$

$$= 0.122\ m/s^2$$

$$\sum F_x = F_{AX} - F_{fk}$$

$$= F_A \cos(30°) - F_{fk}$$

$$= 2.4\ N$$

$$F_{fk} = \mu_k F_N$$

$$= (.500)(151\ N)$$

$$= 75.5\ N$$

$$\sum \vec{F}_y = 0$$

$$F_N + F_{AY} - F_g = 0$$

$$F_N = F_g - F_{AY}$$

$$= mg - F_A \sin(30°)$$

$$= 151\ N$$

A box of books weighing 325 N moves at a constant velocity across the floor when the box is pushed with a force of 425 N exerted downward at an angle of 35.2 degrees below the horizontal. Find mu_k between the box and the floor.